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1945

TM 11-400

WAR DEPARTMENT TECHNICAL MANUAL

U.S. Dept. of Army

**PHOTOGRAPHIC
SET PH-261**



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DISSEMINATION OF RESTRICTED MATTER.
The information contained in restricted documents and the essential characteristics of restricted materiel may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 28, AR 380-5, 15 Mar. 1944.)

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PHOTOGRAPHIC SET PH-261



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WAR DEPARTMENT,
WASHINGTON 25, D. C., 18 January 1945

TM 11-400, Photographic Set PH-261, is published for the information
and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

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The Adjutant General.

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*11-267.

(For explanation of symbols see FM 21-6.)

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DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN — When ordered by your commander.

HOW —

1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut — Use axes, handaxes, machetes.
3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives — Use firearms, grenades, TNT.
5. Disposal — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT —

1. Smash — Lenses, camera, enlarger head, control unit, developing tank, lamps, graduate, synchronizer, lens hood, retainer ring, adapter ring and insert, filter, thermometer, bottles or tubes of developer and fixer, and the case.
2. Cut — Cables, canvas cover, carrying strap, connector for use with a battery.
3. Burn — Film, sponge, technical manual, cable release, paper, remains of cases.
4. Bend — Shaft that supports the enlarger head.
5. Bury or scatter — All remains.

DESTROY EVERYTHING

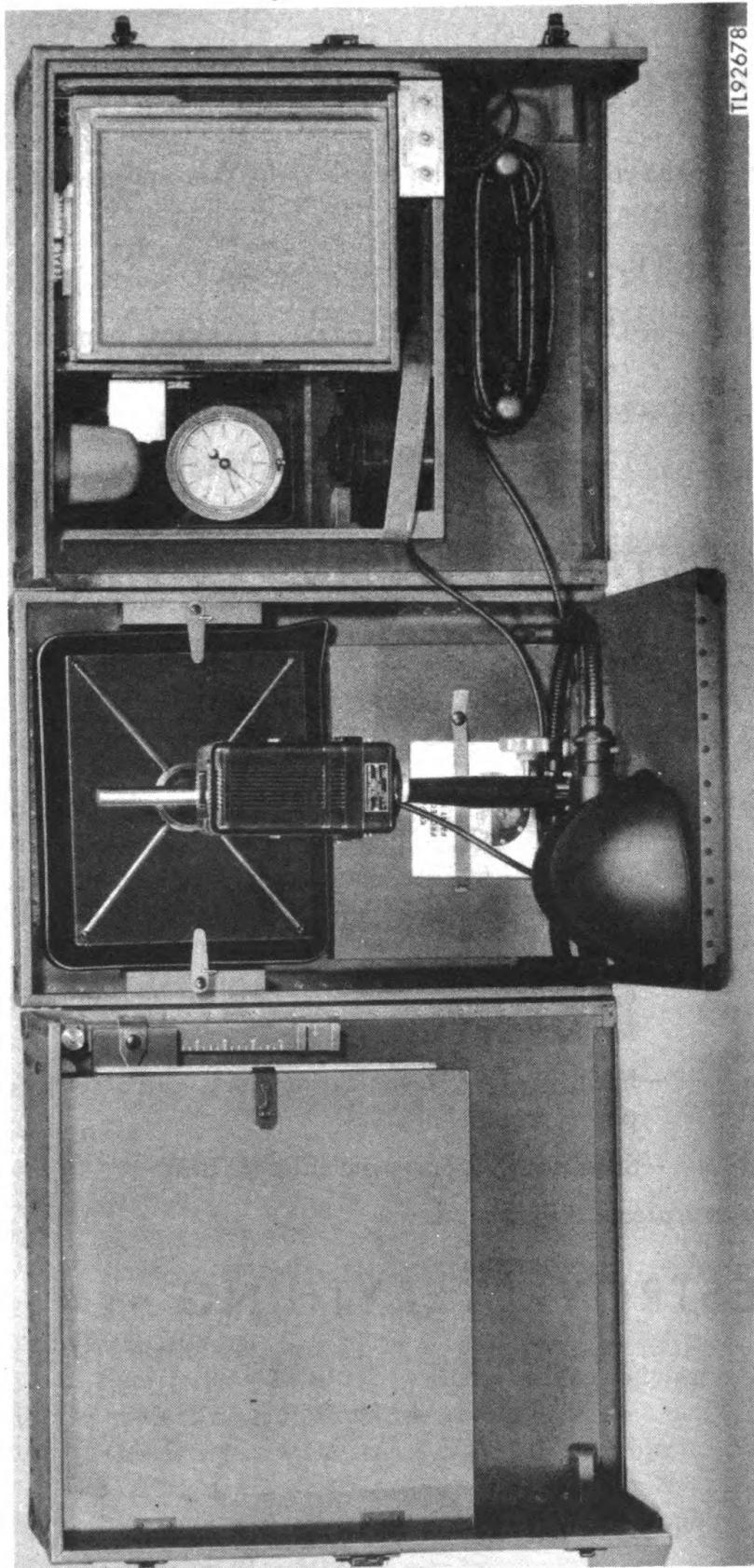


Figure 1. Photographic Set PH-261, open view.

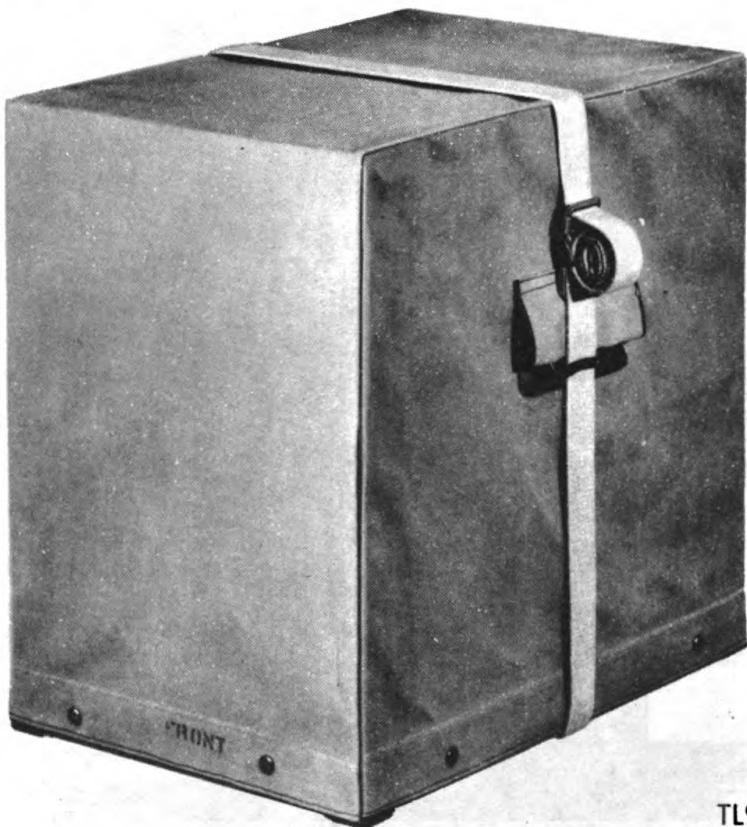
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SECTION I DESCRIPTION

1. GENERAL.

This manual contains descriptive data, directions for installation and operation, maintenance instructions, and maintenance parts lists for Photographic Set PH-261 (fig. 1). The set consists of a case containing Camera PH-324, Enlarger PH-275-A, Exposure Meter PH-77-D, and sufficient additional material for taking pictures, processing film, and making enlargements. The carrying case is so arranged that all equipment can be packed quickly for moving. With the exception of the copying lights, Photographic Set PH-261 can be operated on either a 6- to 8-volt or a 100- to 120-volt supply. The copying lights can be used only on a 100- to 120-volt supply.



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Figure 2. Cover and strap.

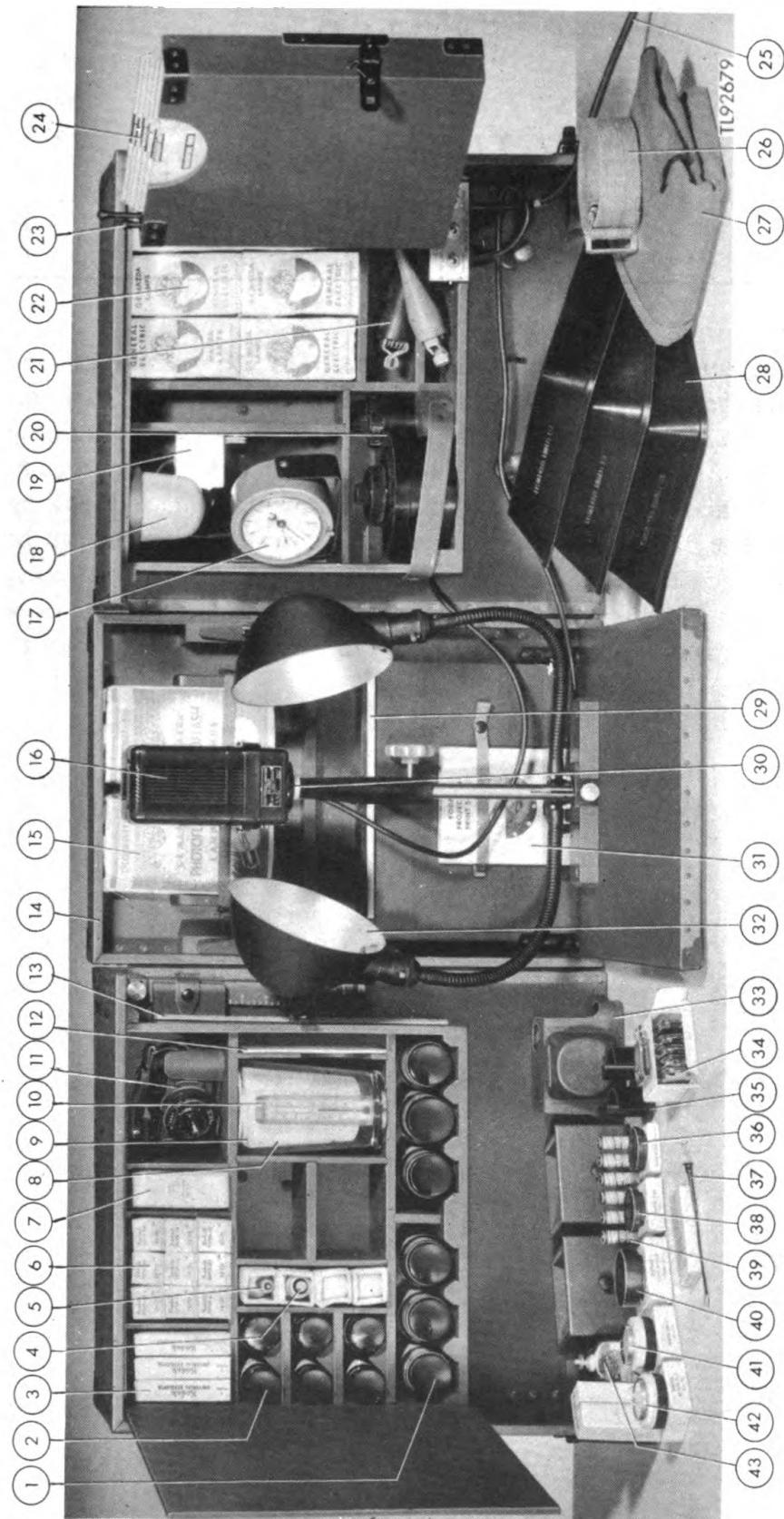


Figure 3. Photographic Set PH-261, contents displayed.

2. TABLE OF COMPONENTS.

Quantity	Name of component	Ref sym (fig. 3)	Dimensions (in.)				
			Height	Width	Depth	Length	Diameter
1	Cover	27	22.5	15.0	21.5		
1	Strap	26		1.5		96	
1	Case PH-318	14	22.0	14.5	21.0		
1	Enlarger PH-275-A	16	18.0	4.0	10.0		
1	Lens, projection (in tube)	30				2.0	2.0
1	Board PH-317		11.0	9.5	1.0		
1	Print scale	31		5.0	0.5	6.0	
1	Timer PH-29-B	17			3.0		4.0
1	Camera PH-324	11	3.25	5.25	3.25		
1	Case PH-371, camera	33	3.5	5.5	3.5		
1	Synchronizer, flash	19	5.5	6.5	4.0		
1	Clamp (Kodapod)	43	1.5	2.0		3.25	
1	Adapter ring	38			0.5		1.975
1	Retaining ring	36			0.475		1.975
1	Filter	42			0.25		1.725
1	Lens hood	40			0.75		2.25
1	Lens, Portra	41			0.25		1.725
6	Film, M-135 Micro-File	6					
12	Film, Super XX	6					
1	Cable Release PH-308	37				6.75	
1	Exposure Meter PH-77-D	7		2.25	1.25	3.75	
1	Case PH-137, meter			3.0	1.625	4.25	
6	Developer, DK-20	2	2.975				1.5
15	Developer, Universal	3	4.0				0.725
6	Hardener and fixer	1	4.0				2.25
1	Graduate PH-11	8	6.0				3.975
2	Rod PH-230	23				10.0	0.5
3	Trays, hard rubber	28	2.25	10.725		12.5	
1	Thermometer PH-28	10		1.250	0.475	4.975	
1	Sponge, viscose	9		3.0	1.5	5.0	
6	Clip PH-165	34		1.25	0.5	2.25	
1	Ruler, 12-inch	13		1.125	0.25	12.00	
30	Blotters, photographic	29		10.25		8.25	
1	Tank PH-322	20	4.0	7.5	5.25		
3	Paper, enlarging, grade 2	24		8.0		10.0	
3	Paper, enlarging, grade 3	24		8.0		10.0	
2	Lamps, safelight, 10-watt	18				2.25	1.25
3	Lamps, safelight, 7½-watt	4				2.25	1.25
3	Lamp, Photo Enlarger, No. 111, 110-v	5				2.25	1.25
2	Lamp, Photo Enlarger, No. 115, 6-v	5				2.25	1.25
16	Lamps, SM Photoflash	15				2.5	1.475
6	Lamps, Photo Enlarger, No. 212	22				4.5	2.5
1	Connector, battery	21		2.75		12.0	

Quantity	Name of component	Ref sym (fig. 3)	Dimensions (in.)			
			Height	Width	Depth	Length
1	Copy lights	32		13.0	3.5	16.0
1	Safelight	18				3.5
1	Paper, lens-cleaning	12		4.0		6.0
6	Batteries, AA	39				2.0
						0.5

3. COVER AND CARRYING STRAP (fig. 2).

The cover for Photographic Set PH-261 is sewed, $14\frac{1}{2}$ - to $15\frac{1}{2}$ -ounce olive drab cotton duck, open at the bottom, and secured to the case by snap fasteners at the lower edge. Overlapping flaps on the sides of the cover permit the strap to be threaded through the handles of the case. The $1\frac{1}{2}$ -inch by 8-foot cotton web strap is complete with buckle.

4. CASE PH-318.

The case for Photographic Set PH-261 is constructed of plywood edged with olive drab trunk fiber. Compartments and drawers furnish spaces for all components. Two trunk latches and a trunk lock secure the case when it is closed. It may be carried by metal handles on the sides.

5. ENLARGER PH-275-A.

Enlarger PH-275-A is similar to Enlarger PH-275. For a complete description and instructions for use refer to TM 11-2368, Enlargers PH-275 and PH-275-A. Enlarger PH-275-A differs from Enlarger PH-275 as follows:

- a. Enlarger PH-275-A utilizes the bottom of the case of Photographic Set PH-261 as a support for Board PH-317, while the base of Enlarger PH-275 forms the paper board and has paper guides attached to it.
- b. The controlling switch for Enlarger PH-275-A is mounted on the CONTROL UNIT in the case of Photographic Set PH-261. Enlarger PH-275 is supplied with a snap switch in the cord.

6. BOARD PH-317.

An 8- by 10-inch metal paper board with a felt base is stored in the door of the right-hand section. Two adjustable masking blades for use with Board PH-317 are held by a strap in the left-hand section of the case. The paper board will accommodate a sheet of 8- by 10-inch paper with $\frac{1}{4}$ -inch margins.

7. PRINT SCALE.

The print scale for determining correct time for enlarging is held in position by a retaining strap in a box in the center section of the case.

8. TIMER PH-29-B.

A spring-driven timer, with both minute and split-second hands which may be reset instantly, is mounted in a bracket in the right-hand section of the set.

9. CAMERA PH-324 WITH CASE PH-371.

For complete description of Camera PH-324, consult TM 11-2361.

10. SYNCHRONIZER.

The synchronizer is stored in the right-hand section of the case directly behind Timer PH-29-B. It is designed for use with either No. 5 or SM Photo-flash lamps and requires no adjustment when used with Camera PH-324. The synchronizer is attached to the camera at the tripod socket. Connection to the camera is made by screwing the synchronizer unit into the cable release socket. Two pen-size pocket flashlight batteries are required to operate the synchronizer. Four batteries are supplied with the set. Cable Release PH-308 is attached to the synchronizer unit and simultaneously fires the lamp and trips the shutter.

11. CLAMP (KODAPOD).

The metal clamp screws into the tripod socket of Camera PH-324. Its toothed jaws can grip a tree, fence, or other wooden objects to hold the camera for exposures longer than 1/25 second.

12. BATTERY CONNECTOR.

The battery connector is used to attach the enlarger to a 6-volt storage battery in the absence of an a-c or d-c power source. This type of electrical connection can be used only with the enlarger and the safelight.

13. LENS ATTACHMENTS.

a. Adapter Ring (fig. 4). The metal adapter ring with spring fingers grips the lens mount of the camera. It is used for attaching the lens hood, filter, or Portra lens to the camera.

b. Retaining Ring. The metal retaining ring holds the filter or the Portra lens in the adapter ring when the lens hood is not used.

c. Filter. The Wratten K-2 filter is a yellow gelatin sheet cemented between two pieces of optical glass and mounted in a metal ring. It is used

when blue sky or water forms a prominent part of the picture or when the camera is used for copying certain types of colored originals.

d. Lens Hood. The black metal lens hood which shades the lens from direct sunlight can be attached directly to the adapter ring or to the retaining ring when it is used with either the Portra lens, filter, or both.

e. Portra Lens. The 2+ Portra lens is a supplementary lens used for copying. It is attached to the camera lens by means of the adapter ring and insert.

14. FILM.

Six rolls of 35-mm Kodak Micro-File film, of 36 exposures each, are stored in the left-hand section of the case. Micro-File film has a high resolving power (ability to record fine detail distinguishably) and is used for line copy work. Twelve rolls of 35-mm Kodak Super-XX panchromatic film, of 36 exposures each, are packed in the same compartment with the Micro-File film. This film is used for general daytime photography or at night with photoflash.

15. CABLE RELEASE PH-308.

A cable release, which is stored in the upper drawer in the left-hand section, is used to trip the camera shutter, or the camera shutter and synchronizer jointly.

16. EXPOSURE METER PH-77-D.

The exposure meter in leather Case PH-137 is stored in the left-hand section of Case PH-318. For complete information about the meter, consult TM 11-2351.

17. PROCESSING MATERIALS.

a. Six bottles of Kodak fine grain Developer DK-20, used in processing film, are stored in compartments in the left-hand section of the case. When mixed with water each bottle makes 1 pint of the developer.

b. Fifteen tubes of Kodak Universal Developer are kept in the left-hand section of the case. Twelve ounces of developer, which is used for processing Aero or other types of enlarging paper and the Micro-File film, can be made from each tube by mixing with water.

c. A 16-ounce glass tumbler, Graduate PH-11, is supplied for mixing the processing solutions.

d. Two hard rubber Rods PH-230, used for mixing the solutions, are stored in the door which holds the enlarging paper in the left-hand section of the case.



Figure 4. Adapter ring, filter, and lens hood.

- e. Three hard rubber 8- by 10-inch trays are stored in the center section of the case, behind the enlarger post.
- f. Thermometer PH-28 is used to check the temperature of the processing solutions.
- g. A viscose sponge, for wiping film after developing, is stored in the glass graduate in the left-hand section of the cabinet.
- h. Six film Clips PH-165, for hanging the film during drying, are stored in the top drawer of the left-hand section.
- i. Thirty 8 1/4- by 10 1/4-inch photographic blotters used for drying prints are packed in the center compartment.

18. TANK PH-322.

Tank PH-322, stored in a compartment in the left-hand section of the set, is made of plastic composition, and is designed for daylight processing of 35-mm black-and-white film in daylight-loading magazines.

19. ENLARGING PAPER.

Two grades of 8- by 10-inch Aero enlarging paper, No. 2 and No. 3, are supplied. This paper has a waterproof base for rapid processing.

20. LAMPS.

The following lamps are supplied as spare parts in the photographic set:

- 2 safelight lamps, 6- to 8-volt, 10-watt.
- 2 safelight lamps, 110-volt, 7½-watt.
- 2 Photo Enlarger lamps, No. 111, 105- to 120-volt.
- 2 Photo Enlarger lamps, No. 115, 6- to 8-volt.
- 16 SM Photoflash lamps.
- 6 Photo Enlarger lamps, No. 212 (for use in copying lights).
- 1 Photo Enlarger lamp, No. 111, 105- to 120-volt (supplied with enlarger).
- 1 safelight lamp, 110-volt, 7½-watt (assembled into the safe-light assembly).

SECTION II

INSTALLATION AND OPERATION

21. UNPACKING.

- a.** Photographic Set PH-261 is shipped completely assembled. Break off the wooden shipping case. Remove the set from the cardboard carton and place it on a flat surface.
- b.** Unbuckle and remove the strap.
- c.** Tuck the flaps into the openings in the side of the dust cover to prevent the carrying handles from catching as the cover is lifted.
- d.** Release the fasteners which secure the bottom edges of the cover and lift off the cover.
- e.** Release the trunk fasteners on the front of the case and swing the two sides open.
- f.** Release the hasp to open the left-hand cabinet. To open the right-hand cabinet, swing the timer forward for access to the hasp.

22. CAMERA PH-324.

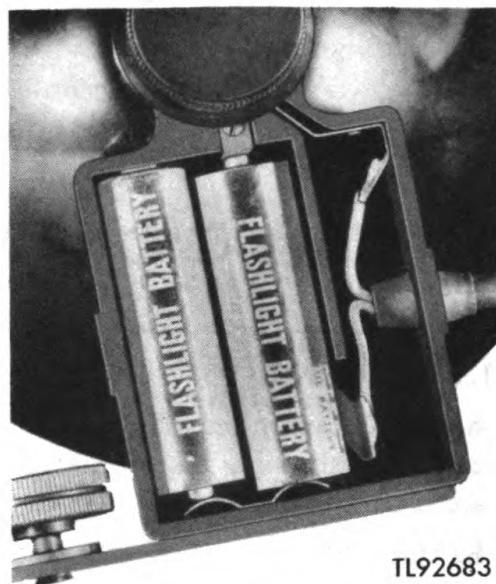
Refer to TM 11-2361 for operation of Camera PH-324.

23. ATTACHMENT OF LENS HOOD AND FILTER (figs. 4 and 5).

- a.** Unscrew the adapter ring insert from the adapter ring and replace the insert with the lens hood. Press the adapter ring over the lens mount so that the spring fingers will grip the lens mount firmly. Use the lens hood to shade the lens from direct sunlight. No change in exposure is necessary when the lens hood is used.
- b.** When blue sky or water forms a prominent part of the picture, use the Wratten K-2 filter to give a natural appearance. Unscrew the insert from the adapter ring, place the filter in the recess of the insert, and screw the insert back into the adapter ring. If the filter is used in conjunction with the lens hood, place it in the recess of the lens hood and screw the lens hood into the adapter ring in place of the insert. Open the lens one stop wider than that shown by the exposure meter or by the daylight exposure table in TM 11-2361.



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Figure 5. Lens hood attached to Camera PH-324.

Figure 6. Batteries in place in battery case of synchronizer.

24. EXPOSURE METER PH-77-D.

Refer to TM 11-2351 for complete instructions for operating the exposure meter.

25. SYNCHRONIZER.

a. To remove the synchronizer from the case, swing the timer forward, and then free the synchronizer unit from the retaining clip. Loosen the large knurled screw until the synchronizer is freed, and draw out the synchronizer. When replacing the synchronizer in the case, make sure that the end hole of the bracket is over the stud in the right wall of the storage compartment before tightening the knurled screw.

b. Remove the cover of the battery case by lifting one of the clips. Place two pen-size (AA) pocket flashlight batteries in the case so that one is head up and the other head down (fig. 6). Replace the cover, making sure that both clips snap into position.

c. Release and remove the front panel of field Case PH-371. Remove the cover screw from the cable release socket on the camera. Disconnect the synchronizer unit from the cord and screw it firmly, but not too forcibly into the cable release socket.

d. Screw Cable Release PH-308 into the end of the synchronizer unit and attach the connecting cord. Brace the synchronizer unit with one hand to prevent damaging it.

e. Remove the knurled screw from the synchronizer bracket and replace it in the hole farthest from the battery case on the opposite side of the bracket. Attach the reflector and battery case to the camera by screwing the knurled screw into the camera tripod socket. For most convenient operation, place the reflector as shown in figure 7.



Figure 7. Camera PH-324 in operating position with synchronizer attached.

f. Attach the synchronizer cord to the synchronizer unit.

g. To obtain the Photoflash lamps, remove the three trays from the center section of the case. Remove the Photoflash lamps from their retaining straps, directly behind the trays. Insert a midget Photoflash lamp into the bayonet socket of the reflector, press it in, and give it a slight clockwise turn to lock it in position. SM lamps are supplied with the set, but No. 5 lamps may be used.

h. To determine the lens stop opening for proper exposures, consult the table in paragraph 26. Divide the proper guide number by the distance in feet from the lamp to the subject. For example, the guide number for the SM Photoflash lamp at 1/100 second with Kodak Plus-X film is 85. At 10 feet (lamp-to-subject distance), divide 85 by 10, and use a lens opening of f/8 which is the nearest marking to 8.5, the quotient.

- i. When the distance and lens opening have been correctly set, check the red indicator on top of the shutter mount to be sure the camera shutter is cocked.
- j. Hold the camera steady and keep the cable release relatively straight during use to avoid kinking it. To make the exposure, press the cable release. Use a uniform pressure at all times.
- k. Remove the flashed lamp by rotating the knurled ejector knob, located on the back of the reflector, counterclockwise.

WARNING: Do not flash lamps within 5 feet of any person unless a protective screen is used over the synchronizer reflector, because the glass bulb may shatter when flashed.

26. PHOTOFLASH LAMP EXPOSURE GUIDE NUMBERS.

Film	SM LAMP		NO. 5 LAMP		
	T, B, 1/25, 1/50, 1/100	1/150	T, B, 1/25, 1/50	1/100	1/150
Panatomic X	70	'63	135	115	105
Plus-X	85	77	165	140	125
Super-XX	125	110	235	195	180
Kodachrome Type A	50	42	90	75	68

NOTE: To determine the proper lens stop opening, divide the applicable guide number by the distance in feet from the lamp to the subject. The table is for use in making exposures in rooms with light-colored walls and ceilings. When making exposures outdoors at night, or indoors with dark-colored surroundings or objects, divide the exposure guide number by two, and then divide that number by the distance in feet from the lamp to the subject.

27. CLAMP (KODAPOD) (fig. 8).

- a. Place Camera PH-324 on a stationary support for time and bulb exposures. Set the camera on a flat surface, or attach it to a convenient object by means of the clamp furnished with Photographic Set PH-261.
- b. Tighten the knurled locking screw on the clamp so that the ball-swivel screw will not turn, and screw the swivel screw into the tripod socket of the camera.
- c. Pull the jaws of the clamp open by means of the finger rings, and place the jaws over a fence rail, tree branch, or other object. Press the points firmly into the surface.
- d. Loosen the locking screw, aim the camera, and tighten the screw again.



Figure 8. Clamp (Kodapod) in operating position with Camera PH-324 attached.



Figure 9. Film processing materials.

e. When the clamp is attached in a horizontal position, place the inside or swinging jaw uppermost.

f. Do not attach the Kodapod to iron or stone. This will dull the teeth. Avoid using any surface which the clamp cannot grip firmly.

WARNING: Keep fingers from between the jaws.

28. FILM PROCESSING.

Chemicals for the fine grain Developer DK-20 and the single powder hardener and fixer are stored in the left-hand section of the case with the graduate, thermometer, and viscose sponge. Film Clips PH-165 are kept in a drawer. Tank PH-322, which is in the right-hand section under Timer PH-29-B, can be removed by releasing the snap at the left end of the retaining strap. Rods PH-230 are kept in holes near the back edge of the door to the right-hand section. The trays are mounted in the back of the center section and are removed by turning up the holding clips.

a. Mixing Chemicals. Make 16 ounces of developer solution by dissolving the contents of one bottle of Developer DK-20 according to the instructions on the label. Cool the solution to 68° F (20° C) by putting it into a tray resting in a larger container of cold water. Using the paper cup in the top of the fixer bottle, prepare 1 pint of fixer solution by dissolving 4 cupfuls of powder in 16 ounces of water. Keep the paper cup dry and return it to the fixer bottle for further use.

b. Loading Processing Tank PH-322.

(1) Tank PH-322 is designed for daylight processing of 35-mm black-and-white film when it is in daylight-loading magazines. The film leader must have the conventional cut-out end and must be extending from the film magazine for development in Tank PH-322. Care should therefore be taken not to wind the leader completely inside the magazine when the exposed film is rewound in the camera. This can be accomplished by stopping the rewinding at the point where either the film counter or the film take-up knob stops rotating. At this point, the exposed film has been rewound into the magazine, and only the leader remains out.

(2) If the film leader is turned accidentally into the camera magazine, it can be retrieved in any room from which all light is excluded. Pull either metal cap of the magazine off and remove the spool of film. Be sure that the film does not spin loose from the spool. Hold the narrow leader end, slide it into the cloth-covered slot in the magazine, and replace the spool in the magazine. Be careful that neither the spool nor the magazine is turned end for end in any of these operations. After the metal cap is replaced, the magazine will again be lighttight and the film ready to be loaded into Tank PH-322.

- (3) Remove the magazine chamber knob (fig. 10) by lifting it vertically. Turn the collar so that the round-nosed index is at LOAD.
- (4) To unlock the cover of the tank from the case, turn the locking knob clockwise until it springs up. The locking knob remains attached to the collar. Lift the cover and reel assembly from the tank by means of the knurled collar.



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Figure 10. Tank PH-322.

- (5) To prevent further rotation, turn the locking knob until it latches. Hold the cover assembly in the left hand and insert the 35-mm film magazine into the bottom of the magazine chamber, with the extended hub of the magazine toward the right.
- (6) Pull the leader end of the film forward to engage it with the knurled metal roller (figs. 11 and 12). Make sure that the end of the film is squarely against the shoulder (fig. 12) of the spiral hub and that the perforated edge of the leader is in contact with the small molded lug (fig. 12) of the bottom flange. Hold the reel in the right hand and push the knurled roller firmly toward the magazine with the thumb of the left hand. If the film is not fastened in the position shown it may not load properly.

- (7) Replace the cover assembly on the tank case.
- (8) Insert the magazine chamber knob (fig. 10) into the top of the magazine by pushing it down and turning it slightly. The knob must be pushed downward until it is flush with the top edge of the magazine chamber. If it is not flush, the film will be fogged while it is being loaded onto the reel.
- (9) Turn the magazine chamber knob clockwise until the film is taut.
- (10) Push the locking knob downward and rotate it clockwise at the same time until it is tight. Gently and steadily turn the knurled collar counterclockwise, as indicated by the arrow on the collar, to draw the film from the magazine into the spiral of the developing reel. Be careful to avoid jerky or erratic motion, which might cause the film to jump out of the proper track in the spiral. Approximately seven turns are required to load a length of film, with 36 exposures. When the film has been completely loaded into the spiral, further rotation should not be forced.
- (11) To cut the film and make the developing chamber lighttight, turn the collar and the round-nosed index (fig. 10) clockwise with a firm rapid action to move the index pointer from LOAD to DEVELOP. Do not hold the center knurled collar.
- (12) Rotate the knurled collar counterclockwise one full turn to draw the

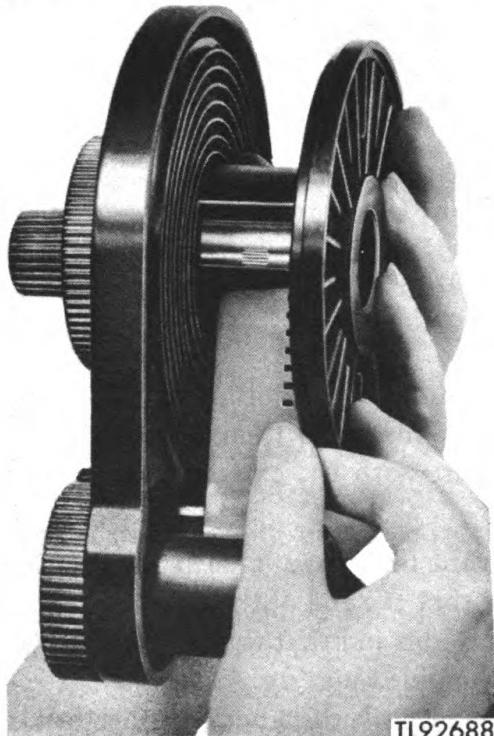


Figure 11. Loading Tank PH-322.

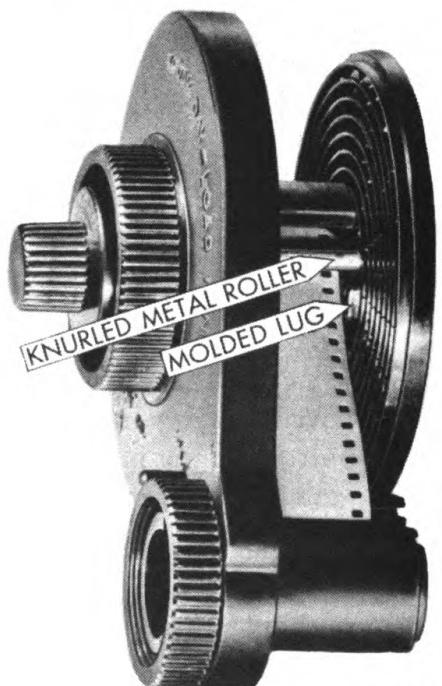
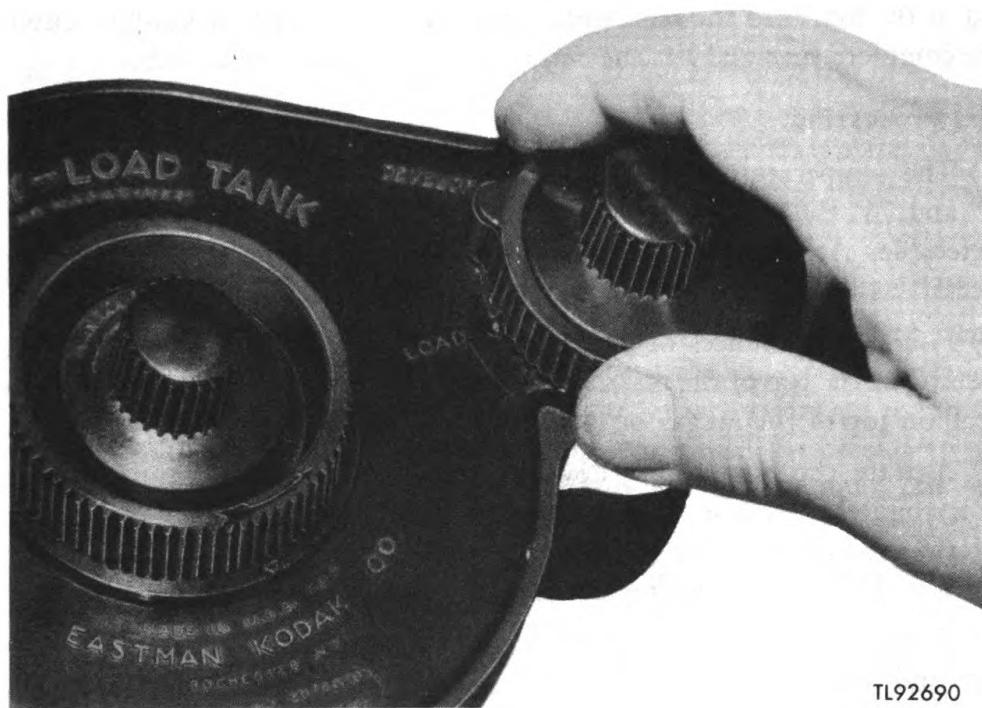


Figure 12. Starting position for threading.

end of the film into the reel. Rotate the magazine chamber knob clockwise one complete turn and lift the empty magazine from the chamber.

c. Processing.

- (1) The temperature of the processing solutions should be kept between 65° and 75° F (18° and 21° C). A steady temperature of 68° F (20° C) is preferable. At higher temperatures precautions are necessary to prevent excessive swelling and softening of the emulsion.
- (2) Pour the 16 ounces of developer solution from the graduate into the opening at the top of the magazine chamber. Replace the magazine chamber knob on top of the magazine chamber.
- (3) Agitate the film during development by rotating the knurled collar in a counterclockwise direction only. To insure uniform development, agitate the film for 1 minute when it is first immersed and for 5 seconds at 2-minute intervals thereafter until development is complete.
- (4) Correct developing time for various temperatures is shown in the time and temperature chart (fig. 14). To measure the solution temperature during development, remove the magazine chamber knob and insert the thermometer. Replace the knob after the temperature measurement.
- (5) After development is complete, remove the magazine chamber knob and pour the developer out through the pouring lip on the end of the tank. Refill the tank immediately with clean water, agitate the film by rotating the knurled collar for 30 seconds, and pour out the water.
- (6) Refill the tank with 16 ounces of fixer solution after developing and rinsing. Agitate for the first 30 seconds and for 5 seconds at 2-minute intervals thereafter until fixation is complete. Fix for 10 minutes if the solution is fresh.
- (7) Pour out the fixer, which may be saved if desired and used again four or five times if stored in a capped bottle.
- (8) Turn the knurled collar (fig. 13) to the LOAD position and place the opening of the magazine chamber under a water faucet. Allow a slow, steady stream of water to flow into the tank for 1 hour. For faster washing or when water is scarce, remove the cover assembly and place the tank in a bucket or deep tray. Wash for 5 minutes each in six changes of water.
- (9) To dry the film fasten the end while it is still on the reel to a film clip suspended from the ceiling or from a shelf (fig. 15). Depress the locking knob to allow free rotation of the reel and pull downward until the film is unwound. Release the film from the reel and place a second clip on the lower end.
- (10) Wet the viscose sponge, squeeze out the excess water, and wipe the



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Figure 13. Cutting film after loading.

front and back of the film to remove water drops (fig. 16). Select a location as free from dust as possible. If the temperatures of the processing solutions and wash water exceed normal, the film emulsions may be excessively soft and swollen. In such cases the wiping must be omitted to avoid damage.

(11) Wash out the tank, cover assembly, and magazine chamber knob. Dry them thoroughly before using them again.

(12) In cases where it is necessary to develop a few exposures at a time, the unexposed film can be saved for later use by cutting the film after the winding collar has been turned just enough to draw the exposed film length into the reel, as indicated below. Watch the arrow on the winding collar when counting the number of turns.

<i>Full turns of knurled collar</i>	<i>Number of exposures plus film leader</i>
2	5
3	10
4	16
5	22

(13) After cutting the film, avoid drawing the end of the film into the magazine by twisting the magazine chamber knob counterclockwise just enough to allow the magazine to be lifted out.

NOTE: When developing a short length make sure that the exposure counter was set properly when the camera was loaded, so that the actual number of exposures is correctly known. Before using the film left in the magazine, pull out about 4 inches from the magazine and cut off a strip, about one-third the film width and 3 to 3½ inches long, to form the narrow leader needed for loading the camera and the tank.

29. ENLARGING.

Enlarger PH-275-A, with negative carrier and lens, is mounted on a post in the center section of the case. The safelight, Timer PH-29-B, switches, and extension cord are built into the right-hand section, and paper Board PH-317, stirring Rods PH-230, and enlarging paper are stored in the door of this section.

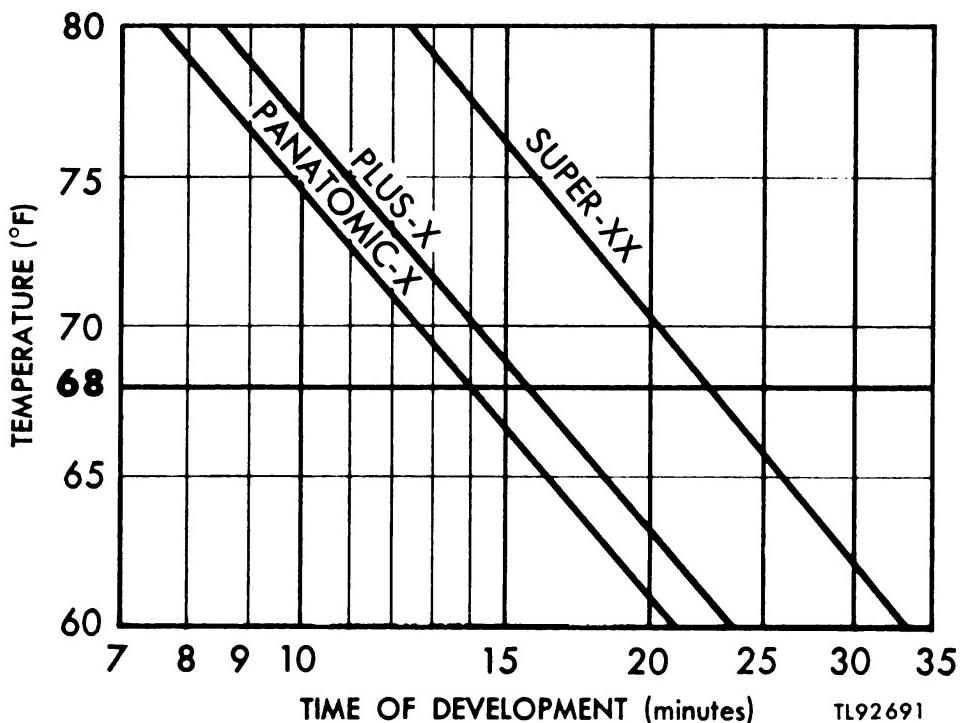


Figure 14. Time and temperature chart for fine grain Developer DK-20.

a. Checking and Setting Up Enlarger PH-275-A.

- (1) Unscrew the safelight cup from the holder and check the lamp to see that the voltage is correct. Use the 6- to 8-volt lamp for battery operation and the 105- to 120-volt lamp when power is from a wall socket.
- (2) Remove the negative holder from the enlarger by sliding it forward and out of its slot. Loosen the screws on each side of the enlarger lamphouse and slide the cover forward and off. Check the lamp, which has a bayonet-type base, for proper voltage. The No. 111 lamp is for 105- to 120-volt, and the No. 115 lamp is for 6- to 8-volt operation.

WARNING: Use a glove or a cloth when removing or installing the lamp to prevent injury in case of breakage.

- (3) Unwind enough of the extension cord to reach the electrical outlet or battery. The plug on the cord fits standard electrical outlets. For 6- to 8-volt battery operation, attach the battery clips to the battery terminals and plug the extension cord into the battery adapter socket on the under side of the CONTROL UNIT.
- (4) Check the safelight and the enlarger lamp by snapping the switches marked SAFELIGHT and ENLARGER on the CONTROL UNIT to ON and OFF positions.
- (5) Before making any enlargements, snap the ACCESSORY switch to ON to make sure that the copying lights are turned off at the sockets. This will avoid fogging paper if the ACCESSORY switch is turned on accidentally in the dark.
- (6) Replace the safelight cup, making sure that it is properly seated in the holder. Replace the cover of the enlarger lamphouse and tighten the screws.

b. Preparations for Enlarging.

- (1) Follow the instructions on the packages for mixing the processing



Figure 15. Removal of film from reel.

Figure 16. Wiping film.

solutions. One tube of the Universal developer makes 12 ounces of solution which is enough for a few prints. For one dozen 8- by 10-inch prints, use two tubes to make 24 ounces of Universal developer and place it in one of the trays.

(2) Mix 16 ounces of hardener and fixer solution and place in one tray. This tray should be marked and used for fixer only. Fill the remaining tray with water.

(3) Bend the copying lights up out of the way. One copying light can be used with the extra safelight lamp to make a convenient white inspection light.

c. Operation.

(1) Operate Enlarger PH-275-A as described in TM 11-2368. Use the 8- by 10-inch metal paper Board PH-317 in place of the paper base board used with Enlarger PH-275.

(2) Remove the mask blades from the left-hand section of the case. Attach the blades to the mounting grooves on the upper side of the platen. Press the mask blades into the grooves and turn the knurled screws to secure the blades in place.

d. Test Prints.

(1) Test prints may be made as described in TM 11-2368 or by using the print scale located in the center section of the case directly behind the enlarger post. Place a 4-inch square of enlarging paper, emulsion side up, in the metal paper board. Cover the paper with the print scale.

(2) Place the edges under the adjustable mask blades of paper Board PH-317. Use No. 2 paper for normal or contrasty negatives and No. 3 for flat negatives.

(3) Expose the paper through the print scale for 1 minute. After development, the correct exposure time in seconds may be read directly from the best-appearing sector on the enlargement.

e. Processing Aero Enlarging Paper.

(1) Maintain all solutions as close to 68° F (20° C) as possible. Develop the print under constant agitation for approximately 1 minute. If the image is too dark at 45 seconds, or not dark enough at 2 minutes, make a new print with respectively half or double the previous exposure.

(2) Rinse for a few seconds.

(3) Allow the first six prints to fix for about 3 minutes in 16 ounces of fixing bath; fix the next six prints for about 5 minutes.

(4) Wash prints for 5 minutes in a good flow of water, or if a flow is not

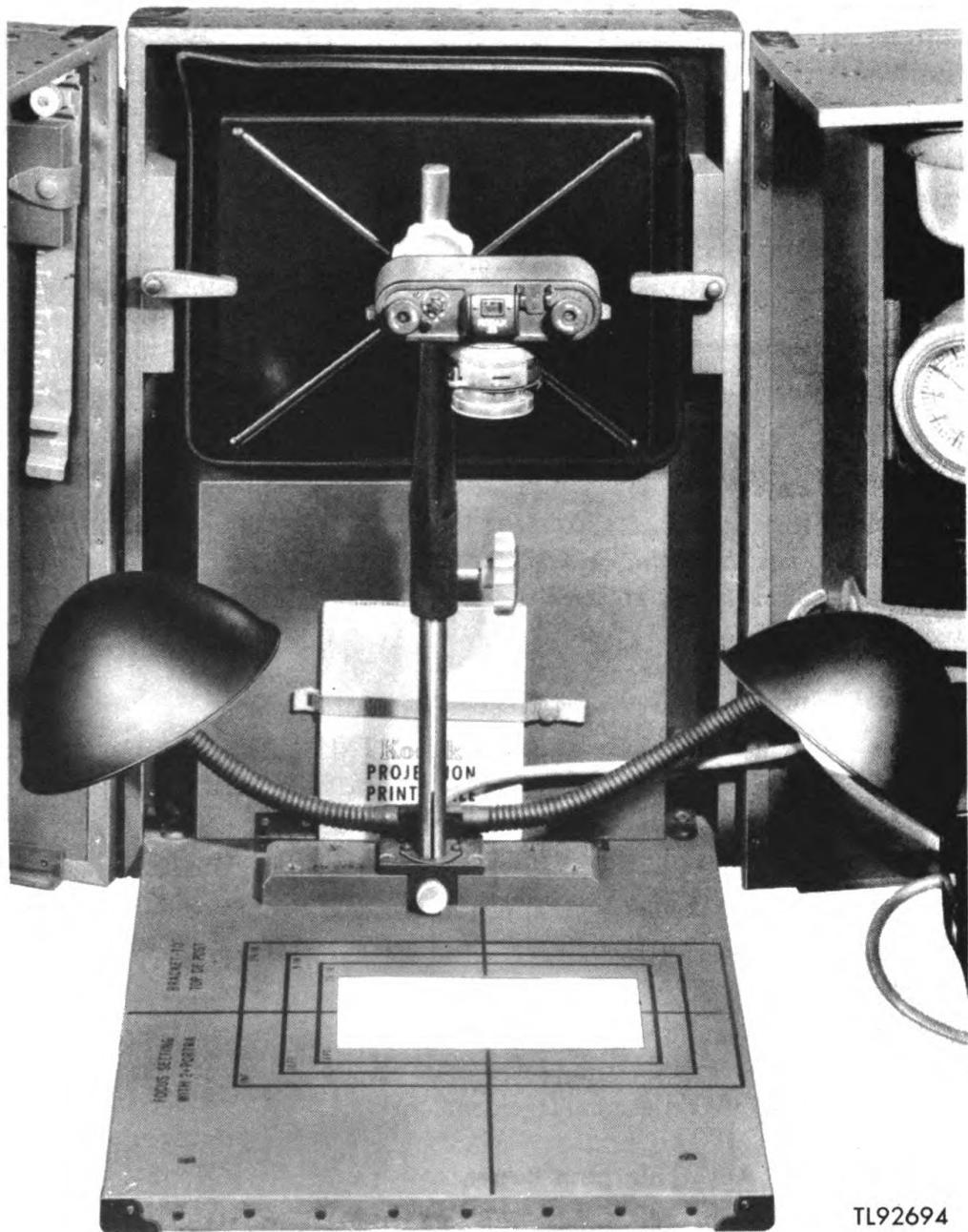


Figure 17. Camera PH-324 and copy lights set for copying.

possible, in at least three complete changes. Allow 2 or 3 minutes for each change. Drain the water from the prints. Wipe off all surface moisture from the back and front with a soft clean cloth, or, if necessary, with a blotter. Lay out face up to dry.

NOTE: When working with regular enlarging papers without a waterproof base, allow the paper to remain in the fixing solution for at least 10 minutes and wash in a good flow of water for 1 hour. Blot off the excess moisture and dry face down on blotters or on clean white cloth. Avoid contaminating the blotters with poorly washed prints.

- (5) Wash and dry trays, graduate, stirring rod, and thermometer before repacking.

30. COPYING.

Pictures of small objects and copies of drawings, documents, and similar material can be made with Camera PH-324 mounted on the enlarger bracket and fitted with a 2+ Portra lens. Illumination for 110 volts only is supplied by the copying lights, using the No. 212 Photo Enlarger lamps, packed in the right section of the case. When 110-volt power is not available, diffused daylight can be used. The ruler clipped to the side of the left section is useful for measuring the camera settings.

a. Film. Use Micro-File film for line originals, such as handwritten or typed documents, printed matter, and line drawings, to obtain high contrast and give good separation of lines from the background. Use a film of normal contrast for small objects and continuous-tone originals, such as photographs. Super-XX or Plus-X film gives good results, though Panatomic-X film is often preferable because its low graininess helps to preserve fine detail.

b. Setting Up Equipment (fig. 17).

- (1) Load the camera with the proper film. For loading instructions, refer to TM 11-2361.
- (2) Unscrew the insert from the adapter ring, place the 2+ Portra lens in the recess, and screw the insert back into the adapter ring (fig. 18). Place the Portra lens with its convex surface and the engraved arrow on the rim, facing forward, away from the camera lens.
- (3) When the K2 filter is used in addition to the Portra lens, use the filter retaining ring to hold the Portra lens in the adapter ring. The filter can then be mounted in the front of the retaining ring by means of the adapter ring insert. *Always place the Portra lens directly in front of the camera lens.* Use the K2 filter when copying yellowed documents or papers written in light blue ink to increase the contrast. Increase the calculated exposure by 1.5 when using the filter.



Figure 18. Adapter ring, Portra lens, and insert.

- (4) Slip the flange of the adapter ring over the rim of the camera lens mount, pressing it on carefully until it is square with the camera axis. If necessary, bend the fingers slightly in or out to grip the lens mount firmly.
- (5) Remove the enlarger head by unscrewing the swivel screw at the top of the sliding bracket. Attach the camera, *without the field case*, to the bracket by turning the swivel screw into the camera tripod socket. Loop the camera carrying strap over the column.
- (6) Raise the bracket, by turning the friction wheel at the back of the column, to bring the camera level with the top of the case.
- (7) Sight across the camera back and adjust it to line up with the top edge of the case; then tighten the mounting screw to hold the camera firmly. Sight across the camera again to make sure that it has not moved.

c. Focusing Adjustments.

- (1) Measure the size of the material to be copied. Areas covered at three camera settings are shown on the baseboard and in the table in subparagraph (2) below, which gives the camera settings for copying with the Portra lens. Whenever practicable, divide the material into units which will fit the smallest field, because it is difficult to light large areas uniformly. The field sizes given do not fill the negative, but are adjusted to come within the opening of the enlarger negative carrier.

- (2) Set the camera focus for the distance shown in the front left corner of the appropriate field area or in second column of the following table.

Useful field size (in.)	Camera lens setting (ft.)	Lens-to-subject distance (in.)	Length of post above bracket (in.)
7½ x 11	Inf.	19½	2¾
6 x 9	10	16⅞	5
5 x 7½	4	14	7⅛

- (3) Move the camera up or down by turning the friction handwheel at the back of the post, to adjust the distance from the subject to the 2+ Portra lens as given in the third column. The proper position can be determined by measuring the height of the post extending above the bracket (fig. 19), or the distance from the lens to the subject and then referring to the table above for the correct setting. It is advisable to check the setting by both methods because the lens-to-subject distance must be accurate.

NOTE: When the subject is, for example, a book or bound manuscript, subtract the thickness of the subject from the value in the fourth column of the table in order to keep the lens-to-subject distance correct.

d. Lighting.

- (1) Check to make sure that the enlarger and safelight do not have 6- to 8-volt lamps; then plug the extension cord to the 100- to 120-volt electrical supply.
- (2) Swing the two sides of the case back, out of the way of the copying lights.
- (3) Screw the No. 212 Photo Enlarger lamps into the copying lights and adjust the arms so that the centers of the reflectors are opposite the center line of the copy space and about 8 inches above the baseboard.
- (4) Make sure that the wire from the copying lights is plugged into the accessory outlet on the under side of the CONTROL UNIT box and turn ON the accessory switch.
- (5) Turn on one lamp and adjust the reflector to give uniform lighting over its end-of-the-field area. Adjust the other reflector similarly. Tilt the reflectors to give a maximum of light on the subject and keep them over the copy as much as possible without allowing them to come between the copy and the camera.
- (6) With both lamps on, examine the subject with the eye placed close to the camera lens. Try to eliminate any bright reflections by flattening the surface of the subject or by adjusting the lamps.

NOTE: In an emergency, when only a 6- to 8-volt supply is available, the enlarger, with its lens tube removed, can be used to furnish illumination. Exposures will be comparatively long. Copying can also be done by daylight, preferably in open shade.



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Figure 19. Measuring to set distance from lens to subject.

e. Determining Correct Exposure.

- (1) Place one of the photographic blotters in position on the copy area, and measure its brightness with Exposure Meter PH-77-D. Take care not to cast any shadows on the sheet.
- (2) Set the arrow on the intermediate dial of the meter over the film-speed number as given in the table below, which shows the exposure meter settings for white card readings. Set the COVER CLOSED arrow opposite the light value figure on the calculator.

Subject Type	Film	Weston		General Electric	
		Tungsten	Daylight	Tungsten	Daylight
Line copy	Micro-File	2.5	4	4	6
	Panatomic-X	4	6	6	10
Continuous-tone copy	Plus-X	6	10	10	16
	Super-XX	12	20	20	32

(3) Make the exposure at the smallest aperture practicable, preferably f/16 or f/11. The two No. 212 lamps operated at normal voltage require an exposure of approximately 1/25 second at f/8 with Micro-File film. If the reading indicates a longer exposure, readjust the copying lights to increase the intensity of light on the copy. There is very little permissible latitude in the exposure because of the high contrast of the film. One-stop underexposure will produce an excessively thin negative, while one-stop overexposure will cause filling-in of letters and fine lines. A good negative has a dense background with clear lines and letters.

(4) Make and develop a series of test exposures of a typical subject, as a check on exposure and focus settings before starting any extensive copying. For developing a short length of film, refer to paragraph 28e (12). When there are only a few subjects, make three negatives of each, one at the calculated setting, one at the next larger aperture, and one at the next smaller aperture. One of these three should be usable.

f. Processing Micro-File Film.

- (1) Dissolve two tubes of Universal developer, according to instructions on the label for tray development of film, to make 16 ounces of solution.
- (2) Load the film into processing Tank PH-322 as described in paragraph 28b.
- (3) Pour the developer solution into the tank and agitate the film as described in paragraph 28e. Develop for 5 minutes at 68° F (20° C). If it is necessary to work at some other temperature, adjust the time accordingly. The time should be approximately 4 minutes at 75° F (23.9° C) or 6½ minutes at 60° F (15.6° C).

- (4) Rinse, fix, and wash as described in paragraph 28.
- (5) After washing, remove the film from the developing reel to a bucket or tray of clean water and swab both surfaces of the film under water with the viscose sponge to remove any dirt or scum. Wash out the sponge and squeeze out the excess water. Hang the film to dry and swab with the viscose sponge to remove all water drops.
- (6) Enlarge the line negatives on No. 3 contrast paper.

g. Processing Plus-X or Super-XX Film.

See figure 14 for the times and temperatures to be used when processing film in Developer DK-20. The times given on the package will also apply in all general processing. When copy negatives of continuous-tone material are being processed, increase the times by 25 percent. Good results can also be obtained by using one tube of Universal developer to make 16 ounces of solution. Develop for approximately 6 minutes at 68° F (20° C).

31. PACKING AND CLOSING CASE.

- a. Return all equipment and supplies to the proper storage spaces. Tighten all holding screws and doors and fasten the holding straps.
- b. To close the door of the right-hand section, swing the timer forward out of the way. After the door has been fastened, press the timer back.
- c. Pack the drawer containing the lens attachments and synchronizer batteries (fig. 20), with the batteries held by the enlarger film supports to prevent accidental short circuits.



Figure 20. Packing spare batteries and accessories.

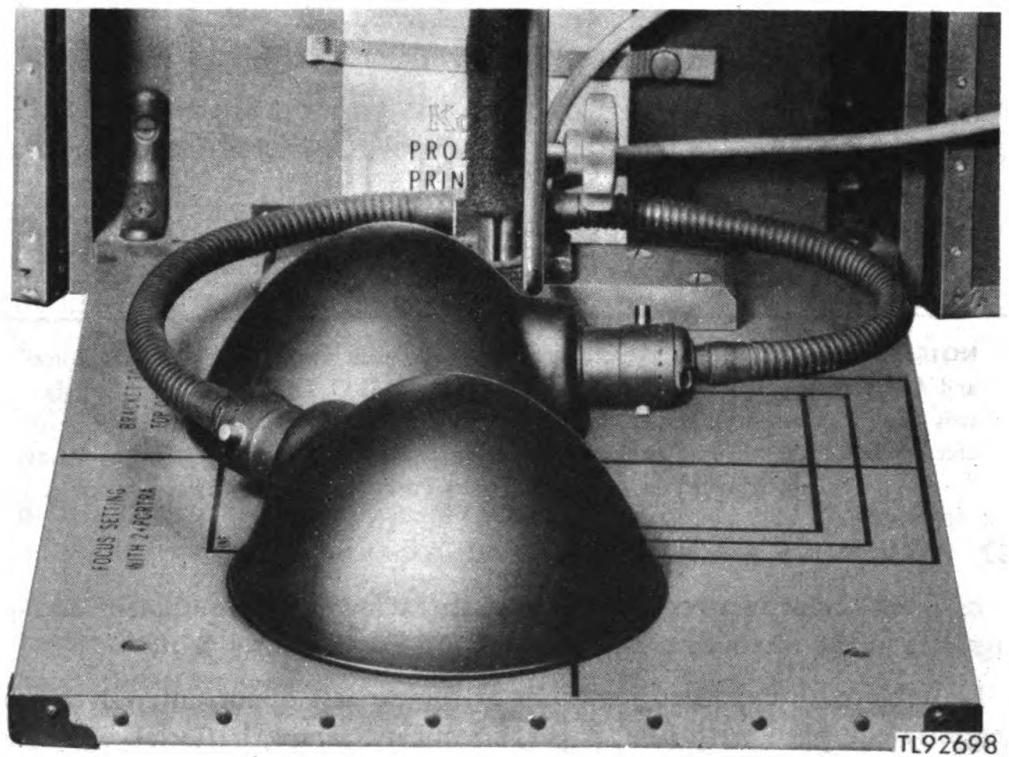


Figure 21. Copy lights in position for closing Photographic Set PH-261.

- d. Lower the enlarger bracket as far as it will go on the column. Screw the lens tube in fully.
 - e. Wind the extension cord snugly around the pegs and place the copying light wire above them.
 - f. Bend the copying lights down flat against the baseboard, with no part extending beyond its edges (fig. 21).
- CAUTION:** If the case does not close readily, *do not force it*. Find what interferes and rearrange properly.
- g. If the snap fasteners on the cover and case do not line up, turn the cover around.
 - h. Place the carrying strap under the case and up through the handles. Fold in the bottom edge of cover flaps.

SECTION III

MAINTENANCE

NOTE: Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report). For particulars see paragraph 36. If Form No. 468 is not available see TM 38-250. Failure or unsatisfactory performance of equipment used by Army Air Forces will be reported on Army Air Forces Form No. 54 (unsatisfactory report.)

32. PREVENTIVE MAINTENANCE.

- a.** Keep the set properly packed, with each item of equipment and all supplies in the intended place, as shown in the assembly print.
- b.** Replace all expended materials at the earliest opportunity. Keep the set fully equipped with film, paper, chemicals, lamps, batteries, and lens-cleaning paper.
- c.** Keep equipment clean. Wash out all processing equipment such as trays, tank and graduate, and other materials after use. Remove any chemicals spilled on or in the case. Avoid the use of excessively hot water which might crack the graduate or thermometer, soften the trays, or otherwise damage equipment.
- d.** Have everything clean and dry before repacking and closing the case. If it is necessary to pack the set before everything, including blotters and sponge, has been fully dried, it should be reopened for airing and drying at the first opportunity. This is particularly important in warm, humid climates.
- e.** Do not leave Photographic Set PH-261 exposed to the heat of the sun. Excessive heat, particularly in the presence of high humidity, has a deleterious effect on the sensitive film and paper, and may cause damage to the camera lens and other equipment.
- f.** Do not force anything into place. If parts of equipment do not fit together readily, find out what the trouble is and correct it.
- g.** Protect the filter from heat and moisture. Do not put pressure on the surfaces in hot or damp weather. To clean the filter, make sure that the surfaces are free from grit or dust; then breathe on them and polish with a piece of lens-cleaning paper.

h. Do not leave batteries in the battery case when the synchronizer is not in use. Most batteries corrode during aging; they may swell and bind in the battery case and cause corrosion of the metal parts.

i. Do not wind the spring of Timer PH-29-B too tightly. If chemicals are splashed on the timer, wipe them off immediately with a damp cloth.

33. LUBRICATION.

The only component of Photographic Set PH-261 requiring lubrication is Enlarger PH-275-A. The lubrication instructions for this enlarger are in TM 11-2368.

34. DISASSEMBLY OF EXTENSION CORD (fig. 22).

a. Unwind the cord from the retaining pegs.

b. Remove the four screws from the switch plate and pull the plate away from the switch box as far as possible.

c. Loosen the cable clamp on the extension cord within the switch box. Remove the friction tape from one lead (5) of the extension cord and disconnect the other lead from terminal (10) of the receptacle. Pull the cord from the hole in the bottom of the switch box.

35. ASSEMBLY OF EXTENSION CORD (fig. 22).

a. Strip the outer sleeving of the cord $1\frac{1}{2}$ inches.

b. Strip each lead end $\frac{3}{4}$ inch.

c. Insert the end of the cord through the hole in the bottom of the control box and through the cable clamp.

d. Splice one lead from the extension cord to lead (5), solder splice, and retape.

e. Connect the other end to terminal (10) of the receptacle.

f. Tighten the cable clamp and replace the control box cover.

36. UNSATISFACTORY EQUIPMENT REPORT.

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equipment Report, W.D., A.G.O. Form No. 468 should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C. Refer to TM 38-250 for complete instructions on the handling of this report.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form No. 54 should be filled out and forwarded through channels.

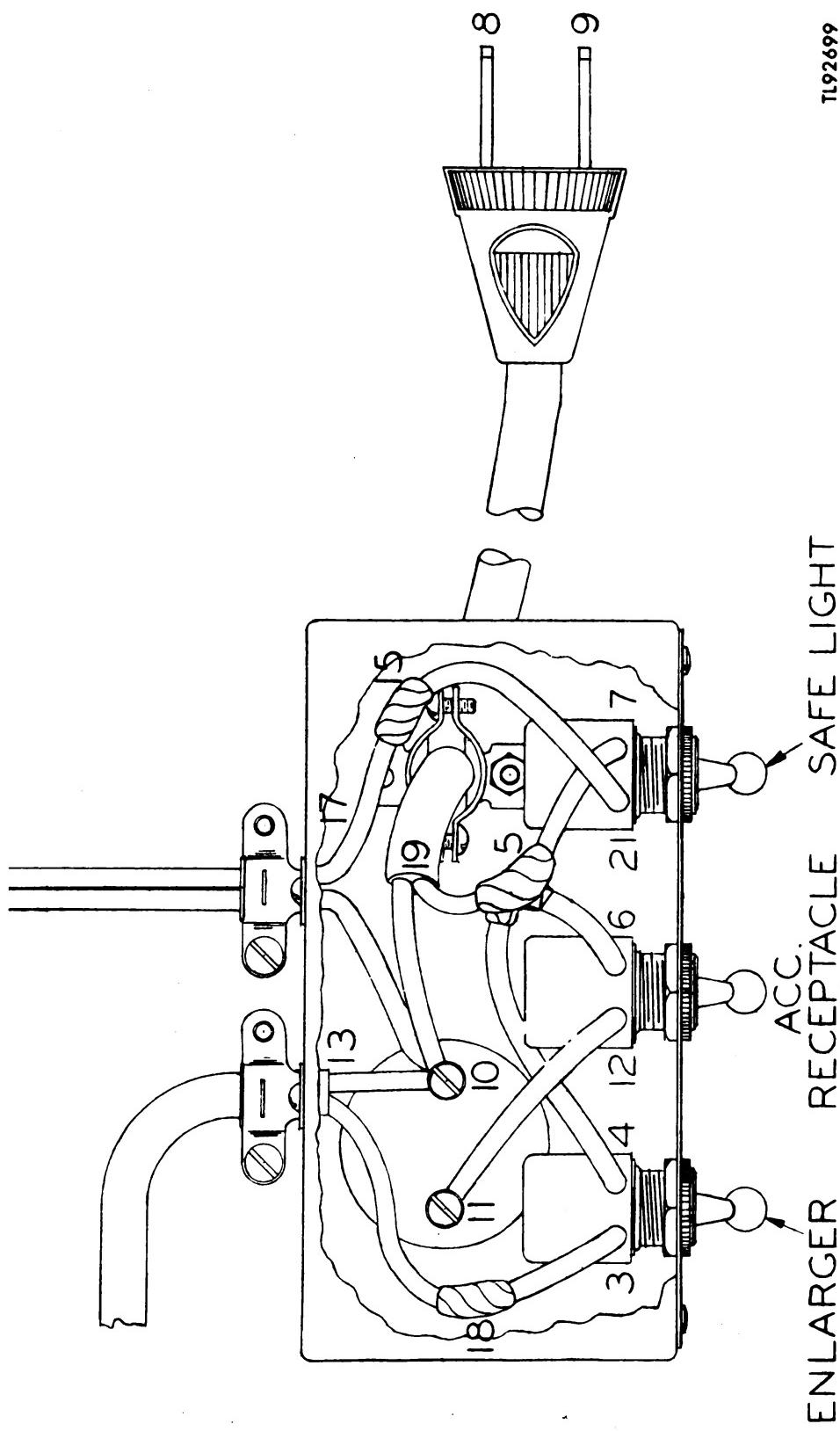


Figure 22. Control unit diagram.

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SECTION IV

SUPPLEMENTARY DATA

37. MAINTENANCE PARTS LIST FOR PHOTOGRAPHIC SET PH-261.

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run-ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
Fig. 3 (37)	8A3278-308	CABLE RELEASE: 7½" lg; PH-308; to fit Camera PH-324; P/o PH-261.	1	*			**	**	*
Fig. 3 (11)	8A424	CAMERA: PH-324; 35-mm still; See TM 11-2361.	1			**	**	**	*
Fig. 1	8A781-318	CASE: carrying, fiber; PH-318. Appr. 15" x 20" x 22". Wired for and designed to contain components of Photographic Set PH-261 in separate compartments.	1			**	**	**	*
Fig. 8	8A2010	CLAMP: Camera mtg; Kodapod, for Camera PH-324.	1			**	**	**	*
Fig. 15	8A825	CLIP: metal, film with wide jaws to minimize film curl; P/o PH-261, PH-165.	6			**	**	**	*
Fig. 3 (21)	8A828	CONNECTOR: Battery; heavy duty; 2 conductors, 2' lg; #16 AWG, tinned copper wire, rubber, then tarred cotton braid insulation; G.E. 10-amp, 250-v female plug on 1 end and 2 storage battery clips (Mueller Elec Co #24A) with rubber sleeves on the other end; p/o PH-261.	1			**	**	**	*
Fig. 3 (25)	8A839	CORD: Extension, 20 ft rubber covered two conductor, 16 gauge, w/standard 110-v male plug; P/o PH-261.	16	20 ft.		**	**	**	*
Fig. 2	8A838-10	COVER: canvas; olive drab; for Case PH-318; P/o PH-261.	1			**	**	**	*

*Indicates stock available.

**Indicates that parts may be requisitioned as needed from depot stocks.

37. MAINTENANCE PARTS LIST FOR PHOTOGRAPHIC SET PH-261 (Contd.).

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Run ning spares	Orgn stock	3d ech	4th ech	5th ech	Depot stock
Fig. 1	8A135-317	EASEL: Photographic, Enlarging: metal, for paper up to 8" x 10" masking blades non-slip base; p/o PH-261. NOTE: In the text this case is referred to as Board PH-317, its correct nomenclature.	1			**	**	**	*
Fig. 3 (16)	8A1052-275A	ENLARGER: miniature Portable, 35-mm; without case or base board, complete with 2-inch f/6.3 projection lens in tube; p/o PH-261. See TM 11-2368, Enlargers PH-275 and PH-275-A.	1			**	**	*	
Fig. 3 (7)	8A1057C.1	EXPOSURE METER: G.E. DW-48. See TM 11-2351.	1			**	**	*	
Fig. 4	8A1099/2-2.1	FILTER: Wratten K-2 (#8) Series VI Unmounted, Kodak, (1 $\frac{5}{8}$ " dia x $\frac{3}{16}$ " W).	1	*	*	**	**	*	
Fig. 3 (8)	8A1411	GRADUATE: Glass, 16 oz, PH-11. No list required; p/o PH-261.	1	*	*	**	**	*	
Fig. 18	8A2551	LENS: Portra, 2 plus Series VI EK #U-10272; p/o PH-261.	1			**	**	*	
Fig. 3 (31)	8A3054	PRINT SCALE: Projection; EK for determining print exposure.	1			**	**	*	
Fig. 7	8A3246	REFLECTOR: Steel, copper-coated; inside depth 2"; chromium plated; OD 5"; has 3 #2 sheet metal screws u/ to fasten on to socket housing of synchronizer p/o 8A3246; p/o PH-261.	1			**	**	*	
Fig. 4	8A3352	RING: Adapter, Series VI, steel chrome plated 1 $\frac{1}{4}$ " dia, to fit Camera PH-324; p/o PH-261.	1			**	**	*	
Fig. 18	8P14.303	RING: Retaining, Series VI, steel, Black Gun Metal, 1 $\frac{7}{8}$ " OD x 1 $\frac{5}{8}$ " ID; p/o PH-261.	1			**	**	*	
Fig. 3 (23)	8A3430	ROD: PH-230; Photographic, stirring 10", hard rubber, acid and chemical proof. No list required; p/o PH-261.	1	*		**	**	*	

Fig. 3	6Z8452-3	STRAP: Webbing; heavy $1\frac{1}{2}$ " x 8'; (u/ on Case PH-318 over cover); p/o PH-261.	1	**	**	*
Fig. 3 (20)	8A3727	TANK: developing, for 18 or 36 exposure, 35-mm film; daylight loading, plastic; p/o PH-261; PH-322.	1	*	**	*
Fig. 3 (17)	8A3829B	TIMER: Photographic, spring wound with special mounting bracket for mtg in case PH-318. Shall have two hands to register minutes and seconds; p/o PH-261; PH-29B.	1	*	**	*
Fig. 3 (28)	8A3925	TRAY: hard rubber, 8" x 10" for developing, washing, and fixing; p/o PH-261.	3	*	**	*
Fig. 7	8P14-166	TRIPPER UNIT: $2\frac{3}{4}$ " lg; max dia $\frac{1}{8}$ "; small dia $\frac{1}{4}$ "; w/2 contact pins $\frac{1}{4}$ " lg x $\frac{1}{8}$ " dia spaced $\frac{1}{4}$ " C to C; used as connector between release cable and shutter to synchronize shutter with flash.	1	**	**	*
Fig. 3 (10)	8A3828	THERMOMETER: photographic, 20 deg F to 120 deg F (E.K. tank type); p/o PH-261; PH-28.	1	*	**	*
Fig. 3 (39)	3A58	BATTERY: penlight cell; type BA-58 1½ volt, approx $\frac{1}{2}$ " dia x $1\frac{1}{8}$ " length; p/o PH-261.	2	2	**	*

Ref symbol	Signal Corps stock No.	Name of part and description	Quan per unit	Runnng spares	Orgn stock	3d cch	4th cch	5th cch	Depot stock
Fig. 3 (17)	8A3829/G1	GLASS: clear, round, $3\frac{1}{4}$ inch dia x $\frac{1}{8}$ inch thick. Used in face of timer.	1	*	*	**	**	*	*

38. MAINTENANCE PARTS LIST FOR TIMER PH-29-B.

*Indicates stock available.
**Indicates that parts may be requisitioned as needed from depot stocks.

